

## CLAIMS

What is claimed is:

1 1. A method for recovery of lost/damaged data comprising the  
2 steps of:  
3 generating candidate hypotheses of decoding for lost/damaged data  
4 within a received bitstream of data;  
5 generating scores for the candidate hypotheses;  
6 selecting a hypothesis corresponding to a best score from the generated  
7 scores;  
8 decoding the lost/damaged data according to the selected hypothesis;  
9 evaluating at least one candidate hypothesis and selectively flagging  
10 data based upon the evaluation; and  
11 executing an error recovery process on the flagged data.

1 2. The method as set forth in claim 1, wherein the step of evaluating  
2 comprises examining at least one score distribution of at least one candidate  
3 hypothesis.

1 3. The method as set forth in claim 2, wherein the step of evaluating  
2 comprises comparing the score distribution to a threshold.

1 4. The method as set forth in claim 2, wherein data of the received  
2 bitstream of data is divided into a plurality of block units of varying length, the  
3 candidate hypotheses indicate the endpoint of at least one block unit, and the  
4 step of evaluating is performed across at least a portion of the plurality of block  
5 units.

1 5. The method as set forth in claim 4, wherein data is flagged for the  
2 plurality of blocks.

1 6. The method as set forth in claim 4, wherein a block unit is selected  
2 from the group consisting of a block or group of blocks.

1 7. The method as set forth in claim 4, wherein the block unit is of  
2 varying lengths.

1 8. The method as set forth in claim 1, wherein:  
2 the received data is divided into a plurality of block units;  
3 the selected candidate hypothesis indicating the endpoint of at least one  
4 block unit; and  
5 the step of evaluating comprising evaluating combined candidate  
6 hypotheses for at least a portion of the plurality of block units.

1 9. The method as set forth in claim 8, wherein the step of evaluating  
2 comprises generating a combined score distribution.

1 10. The method as set forth in claim 9, wherein the step of evaluating  
2 comprises comparing the combined score distribution to a combined threshold.

1 11. The method as set forth in claim 2, wherein the score distribution  
2 is determined according to a difference function between values derived from  
3 the scores of the candidate hypotheses.

1 12. The method as set forth in claim 2, wherein the score distribution  
2 is determined according to the difference between a best score of scores of the  
3 candidate hypotheses and a second best score of the scores of candidate  
4 hypotheses.

1 13. The method as set forth in claim 1, wherein the bitstream  
2 comprises data selected from the group consisting of correlated data, image  
3 data and audio data.

1 14. The method as set forth in claim 1, wherein the bitstream  
2 comprises image data and the error recovery process comprises a pixel error  
3 recovery method.

1 15. The method as set forth in claim 10, wherein the bitstream  
2 comprises image data divided into a plurality of blocks and the error recovery  
3 process comprises a pixel error recovery process that uses neighboring block  
4 information to recover pixel data of flagged data.

1 16. An apparatus for recovery of lost/damaged data comprising:  
2 a data recovery circuit configured to generate candidate hypotheses for  
3 lost/damaged data within a received bitstream of data, generate scores for the  
4 candidate hypotheses, select a hypotheses corresponding to a best score from  
5 the generated scores and decode the lost/damaged data according to the  
6 selected hypothesis;  
7 an error propagation detection circuit coupled to the data recovery  
8 circuit, the error propagation circuit configured to selectively flag data based  
9 upon an evaluation of the candidate hypotheses; and

10 an error recovery circuit coupled to the data recovery circuit and the  
11 error propagation detection circuit, the error recovery circuit configured to  
12 execute error recovery on the flagged data.

1 17. The apparatus as set forth in claim 16, wherein the error  
2 propagation circuit performs an evaluation by examining at least one score  
3 distribution corresponding to the candidate hypotheses.

1 18. The apparatus as set forth in claim 17, wherein the error  
2 propagation circuit performs an evaluation by comparing the score distribution  
3 to a threshold.

1 19. The apparatus as set forth in claim 16, wherein the bitstream  
2 comprises image data and the error recovery method comprises a pixel error  
3 recovery method.

1 20. The apparatus as set forth in claim 16, wherein the bitstream  
2 comprises image data divided into blocks and the error recovery method  
3 comprises a pixel error recovery method that uses neighboring block  
4 information to recover pixel data of flagged data.

1 21. The apparatus as set forth in claim 17, wherein received data is  
2 divided into a plurality of block units, the candidate hypotheses indicating the  
3 endpoint of at least one block unit, the score distribution assembled across at  
4 least a portion of the plurality of block units.

1 22. The apparatus as set forth in claim 21, wherein the error  
2 propagation detection circuit flags the data in the plurality of blocks for which  
3 an error recovery method is required.

1 23. The apparatus as set forth in claim 21, wherein a block unit is  
2 selected from the group consisting of a block or group of blocks.

1 24. The apparatus as set forth in claim 21, wherein the received data is  
2 divided into a plurality of block units, the selected candidate hypothesis  
3 indicating the endpoint of at least one block unit and the evaluation comprising  
4 an evaluation of combined candidate hypotheses for at least a portion of the  
5 plurality of block units.

1 25. The apparatus as set forth in claim 24, wherein the evaluation  
2 comprises a combined score distribution using score distributions  
3 corresponding to at least a portion of the plurality of block units.

1 26. The apparatus as set forth in claim 25, wherein the evaluation  
2 further comprises a comparison of the combined score distribution to a  
3 combined threshold.

1 27. The apparatus as set forth in claim 17, wherein the score  
2 distribution is determined according to the difference between a best score of  
3 scores of the candidate hypotheses and a second best score of the scores of  
4 candidate hypotheses.

1 28. The apparatus as set forth in claim 16, wherein the bitstream  
2 comprises data selected from the group consisting of correlated data, image  
3 data and audio data.

1 29. The apparatus as set forth in claim 16, wherein the data recovery  
2 circuit and error propagation detection circuit comprises circuitry selected from  
3 the group consisting of logic circuits and a processor.

1 30. A computer readable medium comprising instructions, which  
2 when executed in a processing system, cause the system to perform the steps  
3 for data recovery of lost/damaged data, comprising:  
4 generating candidate hypotheses of decoding for lost/damaged data  
5 within a received bitstream of data;  
6 generating scores for the candidate hypotheses;  
7 selecting a hypothesis corresponding to a best score from the generated  
8 scores;  
9 decoding the lost/damaged data according to the selected hypothesis;  
10 evaluating the candidate hypotheses and selectively flagging data based  
11 upon the evaluation; and  
12 executing an error recovery process on the flagged data.

1 31. The computer readable medium as set forth in claim 30, wherein  
2 evaluating comprises examining at least one score distribution of at least one  
3 candidate hypothesis.

1 32. The computer readable medium as set forth in claim 31, wherein  
2 evaluating comprises comparing the score distribution to a threshold.

1 33. The computer readable medium as set forth in claim 30, wherein  
2 the data of the received bitstream of data is divided into a plurality of block  
3 units of varying length, the candidate hypotheses indicate the endpoint of at  
4 least one block unit, and the step of evaluating is performed across at least a  
5 portion of the plurality of block units.

1 34. The computer readable medium as set forth in claim 33, wherein  
2 data is flagged for the plurality of blocks.

1 35. The computer readable medium as set forth in claim 33, wherein a  
2 block unit is selected from the group consisting of a block or group of blocks.

1 36. The computer readable medium as set forth in claim 30, wherein:  
2 the received data is divided into a plurality of block units;  
3 the selected candidate hypothesis indicating the endpoint of at least one  
4 block unit; and  
5 the step of evaluating comprising evaluating combined candidate  
6 hypotheses for at least a portion of the plurality of block units.

1 37. The computer readable medium as set forth in claim 36, wherein  
2 the step of evaluating comprises generating a combined score distribution.

1 38. The computer readable medium as set forth in claim 37, wherein  
2 the step of evaluating comprises comparing the combined score distribution to  
3 a combined threshold.

1 39. The computer readable medium as set forth in claim 30, wherein  
2 the bitstream comprises data selected from the group consisting of correlated  
3 data, image data and audio data.

1 40. An apparatus for recovery of lost/damaged data comprising the  
2 steps of:

3 means for generating candidate hypotheses of decoding for  
4 lost/damaged data within a received bitstream of data;

5 means for generating scores for the candidate hypotheses;

6 means for selecting a hypothesis corresponding to a best score from the  
7 generated scores;

8 means for decoding the lost/damaged data according to the selected  
9 hypothesis;

10 means for evaluating the candidate hypotheses and selectively flagging  
11 data based upon the evaluation; and

12 means for executing an error recovery process on the flagged data.

1 41. A method for recovery of data comprising the steps of:

2 generating candidate hypotheses for lost/damaged data within a  
3 received bitstream of data;

4 assembling at least one score distribution using candidate hypotheses;

5 and

6 selectively flagging data that an error recovery method is required for  
7 based upon the score distribution.

1 42. The method as set forth in claim 41, wherein data of the received  
2 bitstream of data is divided into a plurality of block units of varying length, the



3 candidate hypotheses indicate the endpoint of at least one block unit, and the  
4 score distribution is assembled across at least a portion of the plurality of block  
5 units.

1 43. The method as set forth in claim 42, wherein the step of flagging  
2 selectively flags the data in the plurality of blocks for which an error recovery  
3 method is required.

1 44. The method as set forth in claim 2, wherein a block unit is selected  
2 from the group consisting of a block or group of blocks.

1 45. The method as set forth in claim 1, wherein the received data is  
2 divided into a plurality of block units, the candidate hypotheses indicate the  
3 endpoint of at least one block unit, the step of assembling comprising the step  
4 of if a score distribution for a block unit of the plurality of block units is within  
5 a range defined by an individual threshold, generating a combined score  
6 distribution of the score distributions for at least a portion of the plurality of  
7 block units; and the step of flagging comprising the step of if the combined  
8 score distribution is within a range defined by a combined threshold, flagging  
9 that an error recovery method is required for the at least a portion of the  
10 plurality of block units.

1 46. The method as set forth in claim 41, wherein the score distribution  
2 is determined according to a difference function between values derived from  
3 the scores of the candidate hypotheses.

1 47. The method as set forth in claim 41, wherein the score distribution  
2 is determined according to the difference between a best score of scores of the  
3 candidate hypotheses and a second best score of the scores of candidate  
4 hypotheses.

1 48. The method as set forth in claim 41, wherein the bitstream  
2 comprises data selected from the group consisting of correlated data, image  
3 data and audio data.

1 49. The method as set forth in claim 41, further comprising the step of  
2 performing an error recovery method for flagged data.

1 50. The method as set forth in claim 49, wherein the bitstream  
2 comprises image data and the error recovery method comprises a pixel error  
3 recovery method.

1 51. The method as set forth in claim 49, wherein the bitstream  
2 comprises image data divided into a plurality of blocks and the error recovery  
3 method comprises a pixel recovery method that uses neighboring block  
4 information to recover pixel data of flagged data.

1 52. An apparatus for recovery of data comprising the steps of:  
2 a data recovery circuit configured to generate candidate hypotheses for  
3 lost/damaged data within a received bitstream of data and assemble at least  
4 one score distribution using candidate hypotheses; and  
5 an error propagation detection circuit coupled to the data recovery  
6 circuit, the error propagation detection circuit configured to selectively flag

7 data that an error recovery method is required for based upon the score  
8 distribution.

1 53. The apparatus as set forth in claim 52, further comprising an error  
2 recovery circuit coupled to the error propagation detection circuit, the error  
3 recovery circuit configured to generate an error recovery method for flagged  
4 data.

1 54. The apparatus as set forth in claim 53, wherein the bitstream  
2 comprises image data and the error recovery method comprises a pixel error  
3 recovery method.

1 55. The apparatus as set forth in claim 53, wherein the bitstream  
2 comprises image data divided into blocks and the error recovery method  
3 comprises a pixel error recovery method that uses neighboring block  
4 information to recover pixel data of flagged data.

1 56. The apparatus as set forth in claim 53, wherein received data is  
2 divided into a plurality of block units of varying length, the candidate  
3 hypotheses indicating the endpoint of at least one block unit, the score  
4 distribution assembled across the plurality of block units.

1 57. The apparatus as set forth in claim 56, wherein the error  
2 propagation detection circuit flags the data in the plurality of blocks for which  
3 an error recovery method is required.

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1 58. The apparatus as set forth in claim 52, wherein received data is  
2 divided into a plurality of block units, the candidate hypotheses indicating the  
3 endpoint of at least one block unit, the error propagation detection circuit  
4 further configured to:  
5 generate a combined score distribution of the score distributions for at  
6 least a portion of the plurality of block units if a score distribution for a block  
7 unit of the plurality of block units is within a range defined by an individual  
8 threshold; and  
9 selectively flag that an error recovery method is required for the at least  
10 a portion of the plurality of block units if the combined score distribution is  
11 within a range defined by a combined threshold.

1 59. The apparatus as set forth in claim 52, wherein the score  
2 distribution is determined according to a difference function between values  
3 derived from the scores of the candidate hypotheses.

1 60. The apparatus as set forth in claim 52, wherein the score  
2 distribution is determined according to the difference between a best score of  
3 scores of the candidate hypotheses and a second best score of the scores of  
4 candidate hypotheses.

1 61. The apparatus as set forth in claim 52, wherein the bitstream  
2 comprises data selected from the group consisting of correlated data, image  
3 data and audio data.

1        62.    The apparatus as set forth in claim 52, wherein the data recovery  
2 circuit and error propagation detection circuit comprises circuitry selected from  
3 the group consisting of logic circuits and a processor.

1        63.    A computer readable medium comprising instructions, which  
2 when executed in a processing system, causes the system to perform the steps  
3 for recovery of data, comprising:  
4        generating candidate hypotheses for lost/damaged data within received  
5 data;  
6        assembling at least one score distribution using at least one candidate  
7 hypothesis; and  
8        selectively flagging data that an error recovery method is required for  
9 based upon the score distribution.

1        64.    The computer readable medium as set forth in claim 63, wherein  
2 received data is divided into a plurality of block units of varying length, the  
3 candidate hypotheses indicating the endpoint of at least one block unit, the  
4 score distribution assembled across the plurality of block units.

1        65.    The computer readable medium as set forth in claim 64, wherein  
2 the instruction that, when executed, flags an error recovery method for the data  
3 flags an error recovery method for the plurality of blocks.

1        66.    The computer readable medium as set forth in claim 63, wherein  
2 received data is divided into a plurality of block units of varying lengths, the  
3 candidate hypotheses indicating the endpoint of at least one block unit, the  
4 instruction which, when executed, assembles a score distribution comprises if a

5 score distribution for a block unit of the plurality of block units is within a  
6 range defined by an individual threshold, generating a combined score  
7 distribution of the score distributions for at least a portion of the plurality of  
8 block units; and the instruction, which when executed flags data comprises if  
9 the combined score distribution is within a range defined by a combined  
10 threshold, flagging that an error recovery method is required for the at least a  
11 portion of the plurality of block units.

1 67. The computer readable medium as set forth in claim 63, wherein  
2 the score distribution is determined according to a difference function between  
3 values derived from the scores of the candidate hypotheses.

1 68. The computer readable medium as set forth in claim 63, wherein  
2 the bitstream comprises data selected from the group consisting of correlated  
3 data, image data and audio data.

1 69. The computer readable medium as set forth in claim 63, further  
2 comprising instructions which, when executed, comprise performing an error  
3 recovery method for flagged data.

1 70. The computer readable medium as set forth in claim 69, wherein  
2 the bitstream comprises image data and the error recovery method comprises a  
3 pixel error recovery method.

1 71. An apparatus for recovery of data comprising:  
2 means for generating candidate hypotheses data recovery methods to  
3 lost/damaged data;

4 means for assembling at least one score distribution using at least one  
5 candidate hypothesis;  
6 means for selectively flagging that an error recovery method is required  
7 based upon the score distribution.

1 72. A method for recovery of data from a bitstream of data  
2 comprising the steps of:  
3 detecting errors in data due to error propagation within the bitstream of  
4 data; and  
5 performing a data error recovery process on data with detected errors.

1 73. The method as set forth in claim 72, wherein the bitstream  
2 comprises data selected from the group consisting of correlated data, image  
3 data and audio data.

1 74. The method as set forth in claim 72, wherein the step of detecting  
2 comprises the steps of:  
3 generating candidate hypotheses for lost/damaged data within a  
4 received bitstream of data;  
5 assembling a score distribution using candidate hypotheses; and  
6 if the score distribution is within a range defined by a threshold,  
7 detecting an error.

1 75. The method as set forth in claim 72, wherein the bitstream of data  
2 comprises image data and the step of performing a data error recovery process  
3 on data comprises using a pixel error recovery process.

1 76. The method as set forth in claim 75, wherein the pixel error  
2 recovery process comprises a classified adaptive pixel error recovery process.

1 77. The method as set forth in claim 72, further comprising the step of  
2 receiving error flags indicative of errors with respect to data of the bitstream,  
3 said step of performing a data error recovery process further comprising  
4 performing the data error recovery process on the data corresponding to  
5 received error flags.

1 78. The method as set forth in claim 72, wherein the step of  
2 performing a data error recovery process is performed on at least one block unit  
3 of data.

1 79. The method as set forth in claim 72, further comprising the steps  
2 of:  
3 decoding at least a portion of the bitstream of data;  
4 preventing data degradation by performing a block unit recovery  
5 process on the decoded data in block units in which errors due to error  
6 propagation are detected, said step of preventing performed prior to the step of  
7 performing a data error recovery process.

1 80. An apparatus for recovery of data from a bitstream of data  
2 comprising the steps of:  
3 a data recovery circuit configured to generate candidate hypotheses for  
4 lost/damaged data within a received bitstream of data;



5 an error propagation detection circuit coupled to the data recovery  
6 circuit, said error propagation detection circuit configured to detect errors in  
7 data due to error propagation within the bitstream of data; and  
8 an error recovery circuit coupled to the error propagation detection  
9 circuit, the error recovery circuit configured to perform a data error recovery  
10 process on data with detected errors.

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82. The apparatus as set forth in claim 81, wherein the bitstream  
comprises data selected from the group consisting of correlated data, image  
data and audio data.

82. The apparatus as set forth in claim 81, wherein the error  
propagation detection circuit generates candidate hypotheses for lost/damaged  
data within a received bitstream of data, assembles a score distribution using  
candidate hypotheses, and detects an error if the score distribution is within a  
range defined by a threshold.

83. The apparatus as set forth in claim 81, wherein the bitstream of  
data comprises image data and the error recovery circuit uses a pixel error  
recovery process.

84. The apparatus as set forth in claim 81, wherein the error recovery  
circuit uses a classified adaptive pixel error recovery process.

85. The apparatus as set forth in claim 81, further comprising a pixel  
error flag circuit configured to receive error flags indicative of errors with

3 respect to data of the bitstream, said error recovery circuit further configured to  
4 performing error recovery on the data corresponding to received error flags.

1 ~~86.~~ The apparatus as set forth in claim 81, wherein the error recovery  
2 circuit performs error recovery on at least one block of data.

1 ~~87.~~ The apparatus as set forth in claim 81, further comprising:  
2 a decoder coupled to receive and decode at least a portion of the  
3 bitstream of data;  
4 a data degradation prevention unit coupled to the decoder and the error  
5 propagation detection circuit and configured to perform a block unit recovery  
6 process on the decoded data in block units in which errors due to error  
7 propagation are detected.

1 ~~88.~~ A computer readable medium comprising instructions, which  
2 when executed in a processing system, causes the system to perform the steps  
3 for recovery of data, comprising:  
4 detecting errors in data due to error propagation within the bitstream of  
5 data; and  
6 performing a data error recovery process on data with detected errors.

1 ~~89.~~ The computer readable medium as set forth in claim 89, wherein  
2 the bitstream comprises data selected from the group consisting of correlated  
3 data, image data and audio data.

1 ~~90.~~ The computer readable medium as set forth in claim 89, wherein  
2 detecting comprises:

3 generating candidate hypotheses for lost/damaged data within a  
4 received bitstream of data;  
5 assembling a score distribution using candidate hypotheses; and  
6 if the score distribution is within a range defined by a threshold,  
7 detecting an error.

91.  
92. The computer readable medium as set forth in claim 89, wherein  
the bitstream of data comprises image data and performing a data error  
recovery process on data comprises using a pixel error recovery process.

92.  
93. The computer readable medium as set forth in claim 89, further  
comprising instructions, which when executed performing a process  
comprising receiving error flags indicative of errors with respect to data of the  
bitstream, the instructions which when executed perform a data error recovery  
process further comprising performing the data error recovery process on the  
data corresponding to received error flags.

93.  
94. The computer readable medium as set forth in claim 89, wherein a  
data error recovery process is applied to at least one block unit of data.

94.  
95. The computer readable medium as set forth in claim 94, further  
comprising instructions, which when executed, perform a process comprising:  
decoding at least a portion of the bitstream of data;  
preventing data degradation by performing a block unit recovery  
process on the decoded data in block units in which errors due to error  
propagation are detected, preventing performed prior to performing a data  
error recovery process.

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An apparatus for recovery of data from a bitstream of data  
comprising the steps of:  
means for detecting errors in data due to error propagation within the  
bitstream of data; and  
means for performing a data error recovery process on data with  
detected errors.

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